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XXX.—*Notes on the Lake of Issyk-kul, and the River Koshkar.*

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[Translated by JOHN MICHELL, Esq.]

MR. NIFANTIEF, an experienced officer of topographers, was the first, in 1847, to lay down the lake of Issyk-kul with any approach to correctness. Before that date the form of the lake was quite unknown. On Klaproth's large map it has the shape of a square, rather oblong from west to east; a form which was subsequently given to it in later maps. Kiepert in his 'Turan zu Ritter's Erdkunde,' gave it a more correct shape in 1852, from the data supplied by Nifantief. But the excellent map of the Berlin geographer is not very valuable now, after the astronomical determinations made in 1859, and especially after the numerous difficult surveys effected by the staff of the Siberian Corps between 1854 and 1860.

It is the longitudes that are generally wrong in the maps hitherto published of Issyk-kul and the country around. Thus, in the detailed map of the Tian Shan, constructed in 1858 from data acquired by Mr. Zackharof at Pekin, Issyk-kul Lake is shown at least 37 miles more to the east than it really is. The same mistake has been repeated in Mr. Semenof's beautiful little map appended to his 'Ascent of the Tian Shan,' translated for this Society by Mr. John Michell. The Fort of Vernoe is placed there in longitude $95^{\circ} 27'$, while the determinations of 1859 have proved it to lie in longitude $94^{\circ} 45'$. Greater accuracy could not, however, have been expected from labours which had no mathematical basis. Mr. Zackharof was in possession of the list of points determined by Espigny, Hallerstein, and Arochi; but this gives only one point near Issyk-kul with any correctness, namely that of Konur-ulen, of which the longitude is considerably in error, although the latitude is tolerably correct. As far as we know, a more correct knowledge of this portion of Issyk-kul and Fort Vernoe is due to Mr. Voronin, a topographer who observed the altitude of the sun with a sextant which he had himself made. On the strength of these observations the latitude of Fort Vernoe was corrected in the map of Western Siberia published in 1848-55. But, unfortunately, in removing the fort to its proper parallel, it was placed to the east of the meridian under which it was inserted in 1855. This was the great mistake of the cartographers, now reproduced in all modern maps of Central Asia.

Since 1859 the geography of the Issyk-kul basin has been placed on a scientific basis, and last summer the exact figure of the lake was laid down by the topographers under my directions. We ascertained the length of the lake to be $169\frac{1}{4}$ versts (about 113 miles), with a breadth approaching 57 versts (38 miles) opposite the mouth of the river Barskaun. The surface of the basin has been estimated at 116 square miles. I can add but very little fresh matter to the information made public within the last few years with regard to the northern slope of the Tian Shan, between the Zauka and the Koshkar rivers, a locality which was not explored until last summer. We naturally found great discordance in the names of the rivers, and some difference in the shape of the lake; but the direction of the Celestial range and of the Koshkar valley, contiguous to it, proved to be quite correctly laid down in my map of 1859. The inaccuracies of previous accounts are remedied in the present notes.

The surface of the Alpine "Warm Sea" is, as we have seen, 116 square miles. Although the brackish, never-freezing water has not the bitterness of sea-water, yet it so far resembles it in taste that it is not used by the natives, and animals will never touch it. The depth of the lake has not been ascertained; but it is at all events very considerable, its bottom being a continuation of the slopes of the neighbouring mountains, which are very abrupt,

especially opposite the Kes-Sengir and the Tosara River. A shoal is, however, said to exist in the centre of the lake. Some stones are certainly visible below the surface of the lake, and resemble the ruins of a town, but nothing positive can yet be said on this subject. This account is founded partly on tradition, partly on the report that about twenty years ago a Russian deserter crossed the lake on a raft and saw buildings under water. Many human bones have been deposited by the waves on the north shore of the lake opposite the river Tura-aigyr; but it is difficult to determine whether these are the skeletons of the former inhabitants of a town now submerged, or merely the remains of some natives who may have fallen in a fight near the lake of Issyk-kul.

The valley of the Zauka is the last locality on the south-eastern side of the lake in any way available as a camping-ground. Farther west, the vegetation grows gradually more scanty, so that it is difficult to find a night's pasturage for a small number of horses. The soil is partly argillaceous, where it is eroded by numerous ravines, partly rocky; large stones covering the greater part of the shore from the Barskaun to the very Kutemaldy, to a distance of some miles inland from the lake. The same was observed on the north side of the lake, from the banks of the Tchu to the Kes-Sengir; but here the stones are smaller. What appears on the map—from the vicinity of mountains and water—to be a valley capable of cultivation, is in reality nothing but a most miserable steppe.

There are only three or four versts along the Kutemaldy River covered with verdure and juicy grasses; these are not found on the south-west of the lake, with the exception of a narrow zone at the water's edge, overgrown, however, with bushes rather than with grass. There is abundance of grass along the rivers falling into the eastern part of the lake, such as the Tiuba, Djirgalan, Karakol, and other rivers; but this is probably due to the vicinity of higher and more humid mountains. The slopes of the Celestial range are also wooded there. Reeds grow, though in very small quantities, on the southern shore, along the Bar-bulak and other rivulets.

The Kirghizes, nevertheless, encamp on the shores of the lake, retiring to the mountains in summer, where there is at all events some grass, and in winter descending into the valley, then covered, where the rock permits, with a scanty verdure very nutritious for their sheep. The Kungéi, or northern shore of the lake, is particularly poor in flora. Even along the valleys of the Diurésu (Diuré-su), Tura-aigyr, and Taldybulak rivulets there are but few "sazes" or places overgrown with grass; the rest of the soil is quite bare, rocky and dreary.*

The Kizyl-ompol or eastern end of the Trans-Tchu range of the Kirghiz Alatau Mountains partakes of the same character. The red slopes of that range, very steep and utterly unwatered from the surface of the Tchu (Koshkar) to the summit, are marked by an entire absence of vegetation. On ascending the Koshkar, grass and partly bushes of the willow species begin to appear, only at a locality called Ortokai, 15 miles from the Kutemaldy. The defile of the Koshkar widens here, forming a valley very convenient for an encampment. But the largest Kirghiz camping-ground is afforded by the valley at the confluence of the Koshkar and the Djuvan-aryk. From this place convenient passes lead across the Celestial range to the Djumgal (Kyzart Pass) and the Kara-gudjir, an affluent of the Naryn (Telek Pass). There is a curious formation of rock-salt on the Beja River, between the Kyzart and Telek passes. This salt, though not quite pure, is sufficiently good for use.

There is scarcely any wood on the whole of the northern slope of the

* This prevails, however, as far as the western part of the shore. There are even fields irrigated by the ordinary Kirghiz method beyond the Kes-Sengir, on the Aksu and Kurmety rivers.

Celestial Mountains, from the Zauka to the westward. These drawbacks render the country uninhabitable. The Kirghizes occasionally occupy small oases along the rivers, but do not remain long encamped on them. The Alatau Mountains are on this account much to be preferred. Kirghizes are always found encamped on their southern slopes, and half of the Great Horde depasture their cattle there. The scarcity of wood is more especially surprising since the Tian-Shan is apparently more favourably situated, with regard to moisture, than the Alatau chain.* Independently of the vicinity of the lake, the Tian-Shan has considerably more snow; so that, judging by the quantity in which it occurs, the chains at the western end of Lake Issyk-kul cannot be estimated at less than 14,500 feet above the sea-level. We might anticipate the existence of many streams on its northern slopes; but such is not the case. A few rivulets, such as the Tchishkan, the three Djargylchaks, Tamga, and Barskaun, fall into the lake between the Zauka and Tosara; but farther west to the Kutemaldy, on an extent of 110 versts (about 75 miles), there are only four small rivers—the Kodji, Ton, Ak-terek, formed by the Konurulen, Ala-Cash, and Ulakol, and three rivulets issuing from the lower ranges, and therefore very shallow. The northern slopes of the Celestial Mountains being very steep, especially opposite the centre of Issyk-kul, the flow of all those streams is impeded by the lower ranges; and this is the cause of their uniting into a small number of channels at a distance from the lake before they pursue their course to the northward.

The Koshkar, or upper course of the Tchu, is the most considerable river on the northern slopes of the Tian-Shan. This turbid stream rises in latitude about $42^{\circ} 7'$, where it is known as the Kyzart. At its head is the Kyzart Pass, the most convenient pass in the whole of that part of the Tian-Shan nearest the lake, presenting the appearance of a saddle on its snowy ridge. After receiving the waters of the Suck, Kara-kol, Shamsi, Djuvan-aryk, Uikek, and Semiz rivulets, the Koshkar becomes so deep as to render it difficult of being forded, and impossible of being crossed through a defile towards the Kutemaldy. Although very considerable, the rapidity of the Koshkar is not so great as that of the Tchu in its passage through the Boam defile, or lower. Even at Old Takmak, *i. e.* 24 miles after it issues from the mountains, the latter has a current of 10 feet per second; the Koshkar but rarely attains a great velocity, and flows visibly slower in the valley where it unites with its affluents. Wood might be very conveniently floated down this river, its bed being less rocky than that, for instance, of the Kok-su to the north of the Ili; but unfortunately there is no wood at all on the neighbouring hills.

On leaving the ravine formed by the lower ranges of the Celestial Mountains, and the eastern end of the Kirghiz-Alatau, the Koshkar sends off a remarkable branch. This is the Kutemaldy rivulet, of which there has been so much talk since the Russians first became acquainted with the Issyk-kul. Our information has been so contradictory and unintelligible, that until last year there was not a single person in Fort Vernoe who could say what the Kutemaldy really was. The more ancient opinion would make the Kutemaldy a channel by which the Tchu receives the waters of Issyk-kul; but the incorrectness of this was proved last year, like other accounts equally wrong. A closer acquaint-

* The barrenness of the mountains which neighbour the western part of Issyk-kul Lake would appear to proceed from the following causes:—1. The steepness of the mountain sides prevents the retention of any atmospheric moisture. 2. The fissures so prevalent in these mountain masses, and particularly in the land-slips, absorb the water. 3. The dryness of the winds which blow from the valley of the Tchu through the Boam defile. And, 4. From the intensity of the sun's rays, which penetrate the transparent thinner strata of the atmosphere. Lake Issyk-kul lies 5200 feet above the level of the sea.

ance with the lake, and a topographical survey of the country around, have proved that the Kutemaldy is merely a branch of the river Koshkar, a bifurcation like the Cassikviari, only on a smaller scale. The whole length of this stream is $3\frac{1}{2}$ versts (about 2 miles); its depth, and therefore breadth, depend on the volume of the Koshkar. In May, 1860, it was 6 feet in some places, and not everywhere fordable. There can be no doubt as to the direction of the current, for the stream flows to the eastward with a rapidity of at least 4 feet per second. We studied on the spot the origin of this stream. The great volume of the Koshkar in turning abruptly to the west, and meeting a projection of clayey cliffs, though of no great height, partly flows off to the right and almost backwards, giving rise to the Kutemaldy, which flows to the east owing to an inclination of the soil in that direction. It may be possible that this branch of the Koshkar was once, as some have reported, an "aryk," or irrigationary canal; but this is not very probable, for the following reasons:—

1. It appears strange that a ditch should have been excavated in the lowest part of the Kutemaldy valley, which would prevent the water from being conveyed to the fields.
2. No collateral ditches are observable, and these always accompany works of this nature.
3. The bed of the rivulet is winding, and its banks are not artificially raised, as they would have been had the bed been excavated.

I shall now say a few words about the Celestial range, and the mountain-passes leading over it to the basin of the Naryn River. Its volcanic character is yearly becoming more doubtful; and we found untrue the statement made last year by some Kirghizes, that there was a "burning mountain" at the upper course of the Tchu. Although some of our guides told us they had heard of such a mountain, yet none of them had ever seen it. There are as many as six passes over the T'ian-Shan between the Zauka and the Koshkar, over an extent of 220 versts (about 150 miles). The best of these are the Barskaun-asu on the east, and the Kyzart on the west. The Zauka Pass has already been described by Messrs. Semenof and Valikhanof: the local Kirghizes consider it only a tolerable pass, worse than that over the upper course of the Djuvan-aryk on the road to Kurtka. The two passes at the upper courses of the Tosar and Aksu (an affluent of the Ton) are very difficult.

I could not but have been much interested in what lay beyond these passes on the southern side of the Celestial Mountains; but of course I could only question the natives on the subject, although I tried to get the most trustworthy information. Even last year I expressed a doubt as to the existence of two parallel chains between the Issyk-kul and the Naryn, and I think this mistake may now be definitely rectified. Not only is there not another row of elevations besides that which gives rise to the affluents of the Issyk-kul, but even the southern face is much more sloping from the crest of the mountains than the northern, so that the elevated Naryn country appears only to rise in small hills. A few rivulets flow off from the Celestial Mountains towards the upper course of the Syr-Daria: the most important of these are the Djaman-ichké, with its affluent the Onarcha; the Sulian-sary; and Kara-gudjir, the greater and lesser, uniting in one stream called the Dergetala. The sources of the Djaman-ichké are contiguous to the Barskaun; the Onarcha rises near the head of the Ton; the Sulian-sary a little more to the west; while the two branches of the Dergetala take their rise in mountains very distant from each other—the greater Kara-gudjir near the Aksa, and the lesser in the vicinity of the Djuvan-aryk. These rivulets first run to meet each other, and, after uniting, fall into the Naryn, one pass above Fort Kurtki.

I obtained very little information about the latter fortification and the neighbouring country; but the little I gathered is of great interest. I refer to the discovery of the situation of the large alpine lake of Son-kul, in a country

neighbouring the upper course of the Djuvan-aryk. This lake, surrounded by the summits of the southern lower ranges of the Tian-Shan, lies midway between the principal chain and the Naryn. Its length from west to east is 18 or 20 versts (12 to 14 miles), and it takes a day to ride round its circumference. The mountains around are not very much above its level; but they must nevertheless be of considerable altitude, as the lake freezes for several months, *i.e.* it lies above the Issyk-kul, which, as before stated, is 5200 feet above the sea. The only outlet which this basin possesses, *viz.* the Kadjirty rivulet, flows in an easterly direction, and falls into the Naryn above Kurtki and near the Dergetala. Klaproth has availed himself of some Chinese information in laying down the lake of Son-kul; but neither its position nor extent of surface, as ascertained by us, agrees with previous accounts. The Jesuits have generally omitted to connect the slopes of the Tian-Shan with the valley of the Naryn; we can easily understand why they removed Son-kul to the westward.

Further information respecting the country of the upper course of the Tchu will be gathered from the following itineraries.

I.—*From the Kutemaldy to Kurtka.*

	Miles.
1. Ortokoi locality, on the Koshkar	14
2. To the Djuvan-aryk	18
3. Aguchak, on the Koshkar, at the confluence of two rivulets ..	
4. Kochanai Spring, flowing into the Kyzart	
5. Kelemché, flowing into the Djungan	
6. Chararcha	
7. Lake Son-kul, over some small mountains	
8. Naryn River	
9. Kurtka Fortress	
9 stages, about	120

II.—*Same journey across the Djuvan-aryk.*

	Miles.
1. Ortokoi	14
2. Djuvan-aryk	18
3. Telek rivulet, before the Pass, a long, tedious, and rocky ..	
stage	
4. Dolon-sary-bulak (falling into the little Kara-gudjir)	
5. Lesser Kara-gudjir River	
6. Dergetal River	
7. Naryn River	
8. Kurtka Fortress	

III.—*From the Kutemaldy to Son-kul on horseback.*

1. Ortokoi.
2. Djuvan-aryk.
3. Kyzart, at the Pass.
4. Chararcha (a long journey).
5. Son-kul.

IV.—*From the Koshkar to the Talas.*

1. At the Pass over the Suek, or rather over Karakol.
2. On the Sumsamyr River, equal in size to the Great Kebin.
3. Again on the Sumsamyr.
4. Along the Alabil rivulet, over a good pass in the hills at Alabil, also belonging to the basin of the Talas.